

# → THE ESA EARTH OBSERVATION $\Phi$ -WEEK

## EO Open Science and FutureEO

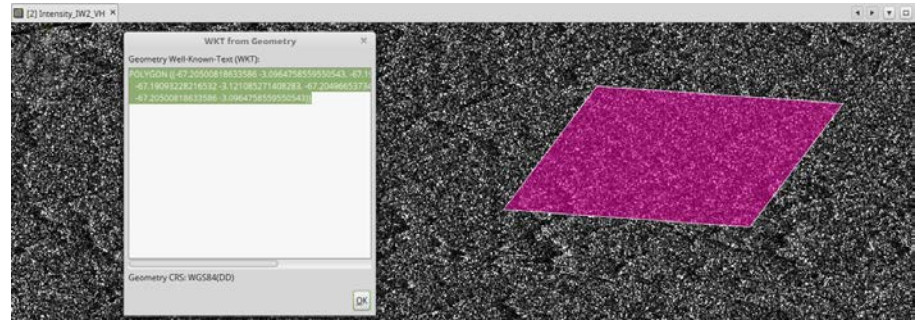
12–16 November 2018 | ESA–ESRIN | Frascati (Rome), Italy

MULTIPLY: Towards a Platform for the Retrieval of Bio-Physical Parameters on User-Defined Spatial and Temporal Grids

Fincke, Tonio / Brockmann, Carsten (Brockmann Consult) / van Bodegom, Peter / Timmermans, Joris (University Leiden) / Gomez-Dans, José / Yin, Feng (University College London) / Ramsauer, Thomas / Weiß, Thomas (Ludwig-Maximilians-Universität München) / M. Lucrecia Pettinari (Universidad de Alcalá)

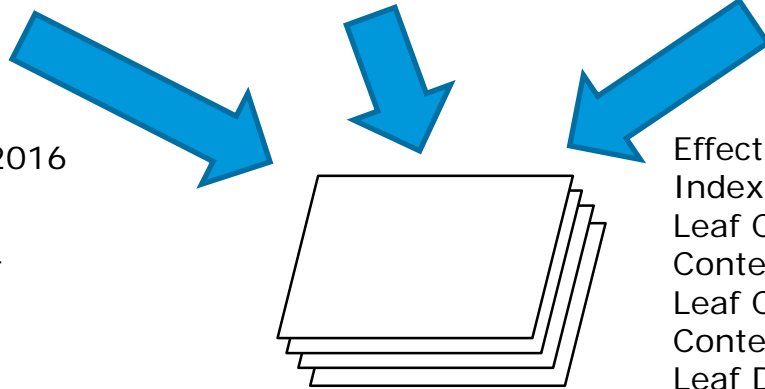
16/11/2018

# Motivation



June 1st to July 31st, 2016  
10 days interval

Region defined by WKT  
At 60m resolution

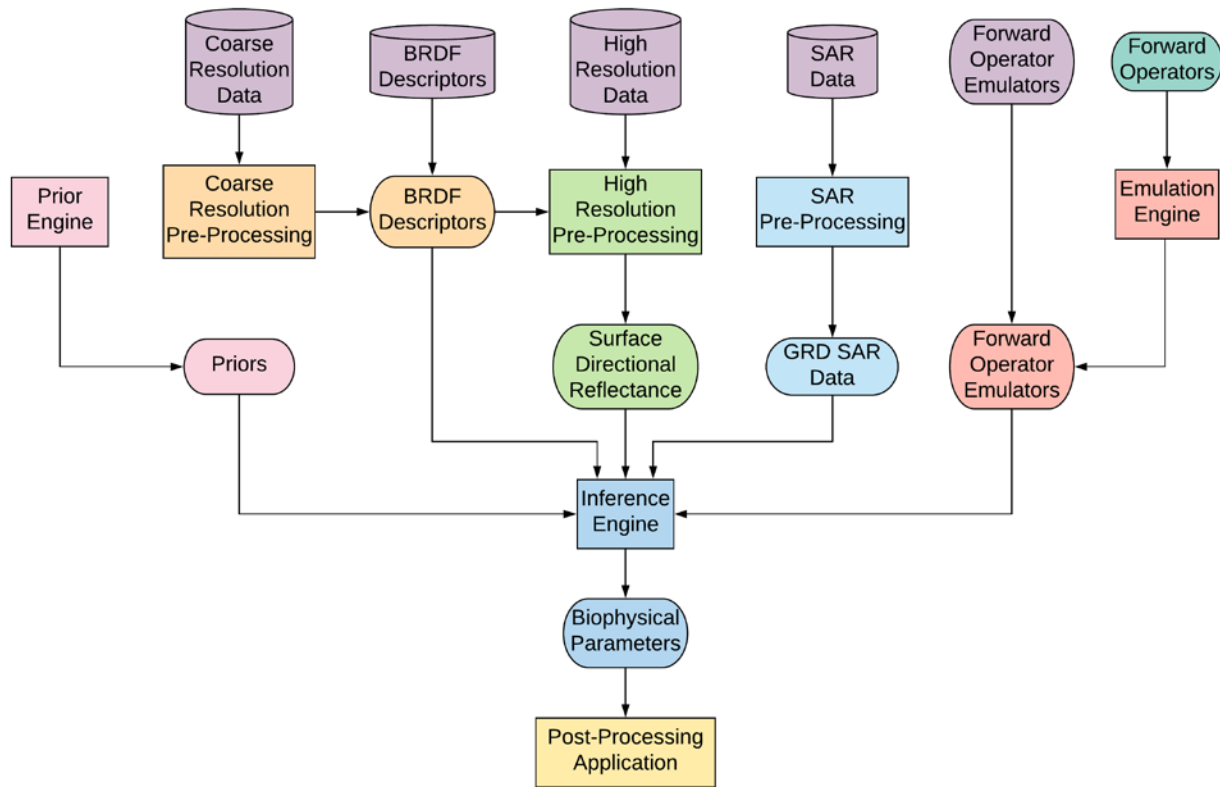


Effective Leaf Area  
Index  
Leaf Chlorophyll  
Content  
Leaf Carotenoid  
Content  
Leaf Dry Mass

Leaf Water Content  
Average Leaf Angle  
Soil Brightness  
Soil Moisture  
...



# Platform Components



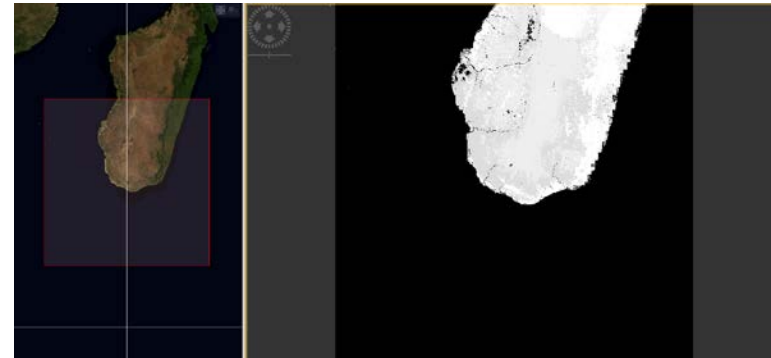
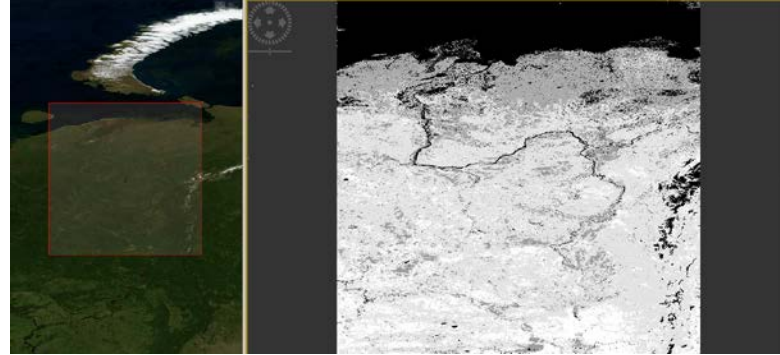
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# Prior Engine

- Provides initial guesses of bio-physical parameters
- Come with parameter variance
- Might be user-provided
- Might be updated with inference results

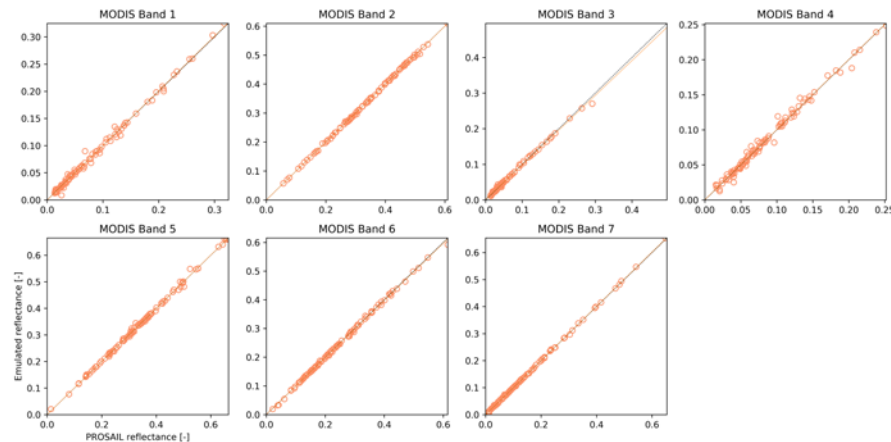


## Encapsulation of Forward Models

- Leaf Chlorophyll Content
- Leaf Dry Mass
- Soil Brightness
- Average Leaf Angle
- ...

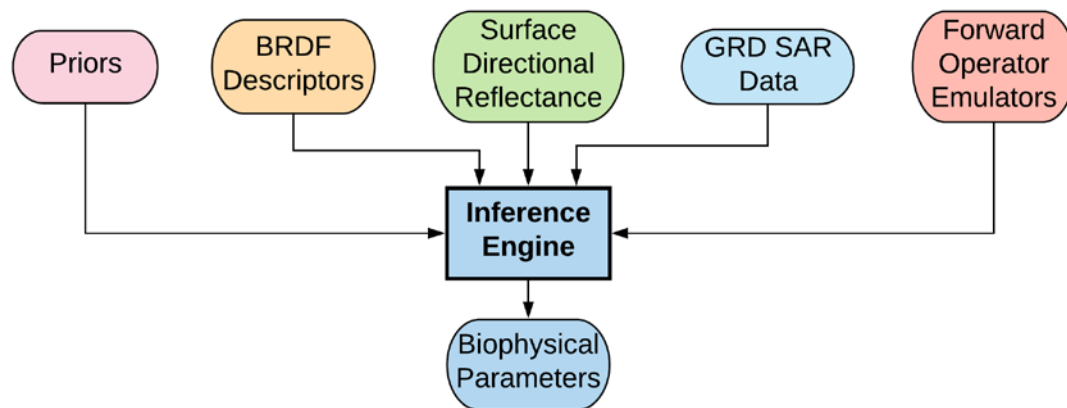


- B01\_surf\_ref
- B02\_surf\_ref
- B03\_surf\_ref
- ...



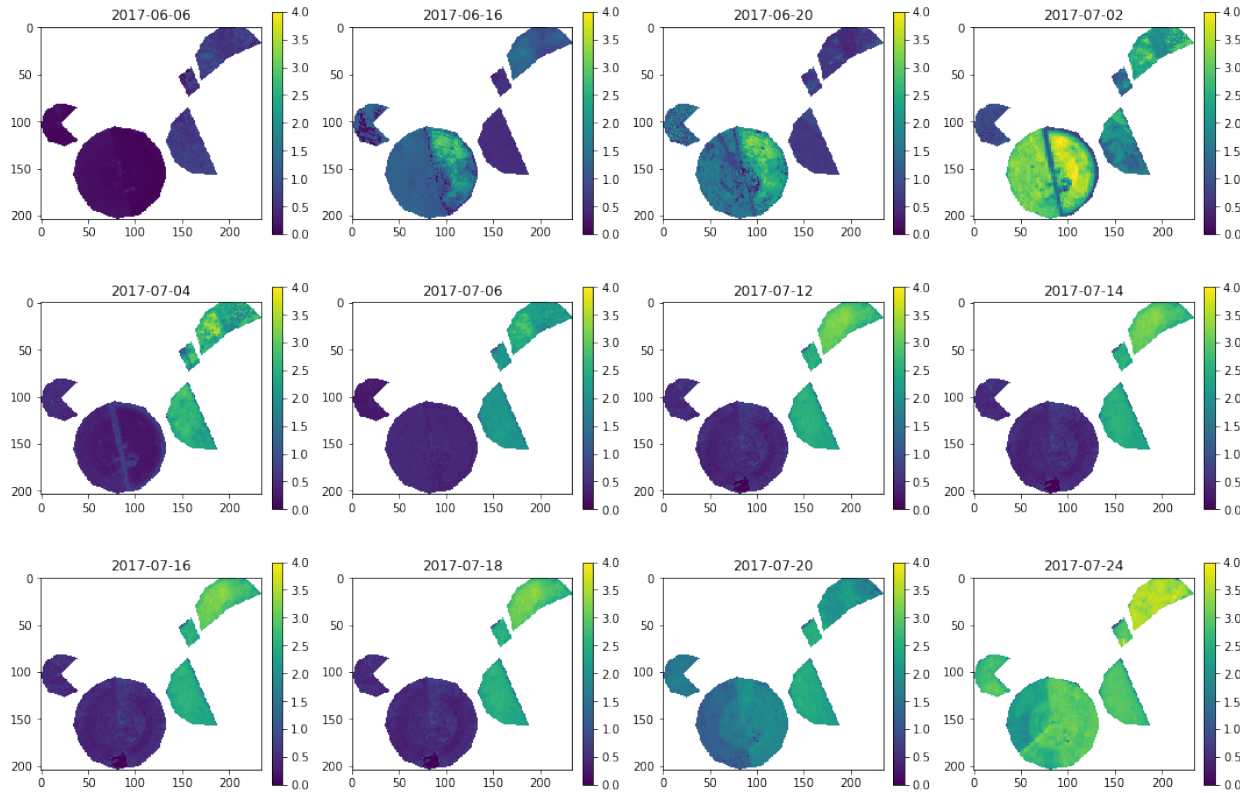
Gómez-Dans, J.L.; Lewis, P.E.; Disney, M. Efficient Emulation of Radiative Transfer Codes Using Gaussian Processes and Application to Land Surface Parameter Inferences. Remote Sens. 2016, 8, 119.

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- Mapping data onto a common grid
- Combining observations per time step
- Providing uncertainty measures

# LAI Time Series



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```
get_static_data
for time_step in time_grid:
    get_non_static_data
    get_priors
    pre_process_coarse_res
    pre_process_high_res
    pre_process_sar
infer
```





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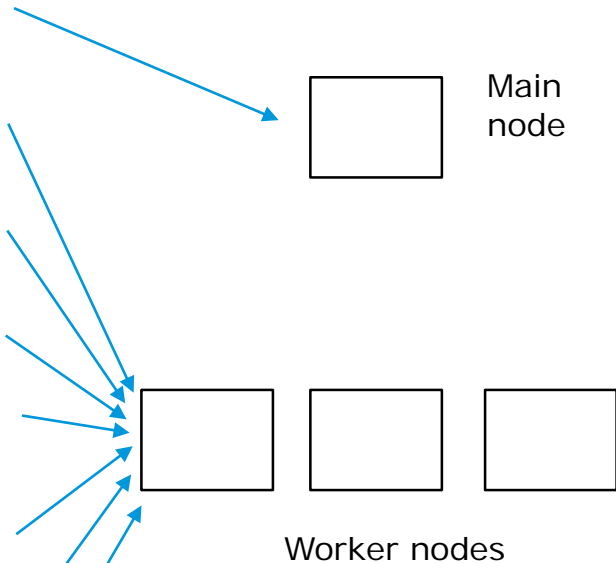
- orchestration
- static\_data\_access
- non\_static\_data\_access
- prior\_engine
- coarse\_res\_pre\_processing
- high\_res\_pre\_processing
- sar\_pre\_processing
- inference

# Orchestration



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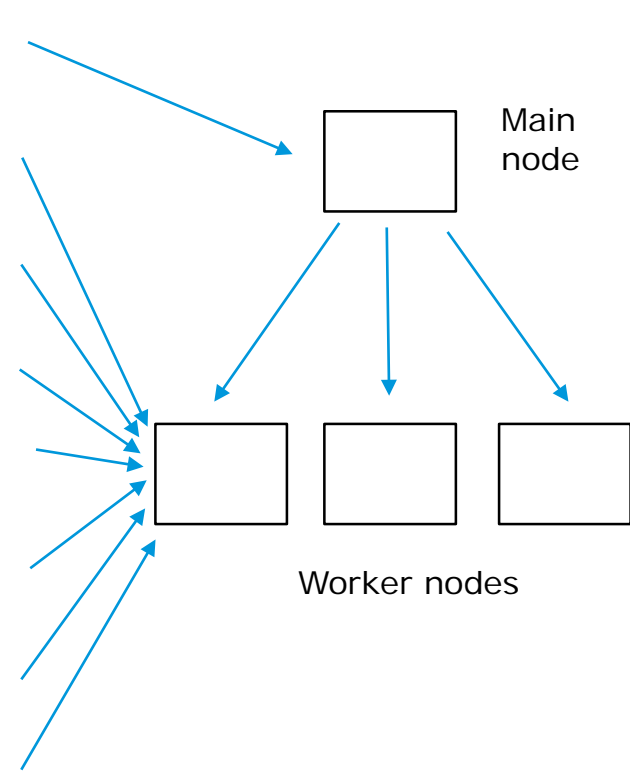


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## Requirements

- Data
  - Access to S1, S2 and S3 data
  - Access to priors (e.g. ESA CCI)
  - CAMS data
- Computational resources
  - Scalability
  - Process Monitoring

Investigation of 5 DIAS platforms ongoing



- MULTIPLY is a software platform for retrieval of biophysical land parameters
  - Using various satellite and other data as input
  - Provided as Jupyter Notebook on VM
- Code available on GitHub ( <http://www.github.com/multiply-org> )
  - Individual Python packages can be run independently
- Work is still in progress
- Deployment on DIAS planned



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